



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,600	06/25/2003	Katsushi Ikeuchi	239510US2	1466
<div>22850      7590      07/03/2007</div> <div>OBLON, SPIVAK, MCCLELLAND, MAIER &amp; NEUSTADT, P.C.</div> <div>1940 DUKE STREET</div> <div>ALEXANDRIA, VA 22314</div>				
			<div>EXAMINER</div> <div>PRENDERGAST, ROBERTA D</div>	
			<div>ART UNIT</div> <div>2628</div>	<div>PAPER NUMBER</div>
			<div>NOTIFICATION DATE</div> <div>07/03/2007</div>	<div>DELIVERY MODE</div> <div>ELECTRONIC</div>

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

**Office Action Summary**

Application No.

10/602,600

Applicant(s)

IKEUCHI ET AL.

Examiner

Roberta Prendergast

Art Unit

2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 26 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 October 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Drawings***

Examiner acknowledges that the petition to enter color drawings has been approved, see the petition decision filed 2/13/2007, therefore the objection to the drawings is hereby withdrawn.

### ***Claim Rejections - 35 USC § 101***

The rejection of claims 8-13 under 35 USC § 101 is hereby withdrawn.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5, 8, 9, 12, 14, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Kawasaki et al. "Image-based rendering for mixed reality", Proceedings 2001 International Conference on Image Processing, Volume 3, 7-10 Oct. 2001, pages 939-942, Sillion et al., 1997, "Efficient Imposter Manipulation for Real-Time Visualization of Urban Scenery." In the proceedings of EUROGRAPHICS, (September), Volume 16, Issue 3, pages 1-12 and Dobashi, et al., "A simple, efficient method for realistic animation of

Art Unit: 2628

clouds" Proc. of 27th Annual Conference on Computer Graphics and interactive Techniques, ACM Press/Addison-Wesley Publishing Co., New York, NY, pages 19-28.

Referring to claim 8, Suzuki et al. teaches an image processing method for generating an image from a predetermined view direction association with an object to be rendered, comprising: optically obtaining a plurality of first images by photographing an object to be rendered from a plurality of different directions (Figs. 1-4; column 1, lines 40-49; column 2, lines 30-37; column 7, lines 26-37 and 50-65; column 9, lines 58-66, i.e. first images are the initial video captured images), generating a second image that pertains to geometry information of the object to be rendered (Figs. 1-4; column 1, lines 40-49; column 2, lines 37-45, i.e. the second images are the silhouette images); generating a geometrical shape model of the object to be rendered on the basis of the second images (Figs. 1-4; column 1, lines 40-49; columns 2-3, lines 65-3; column 4, lines 15-20; columns 7-8, lines 65-8; column 8, lines 20-50; column 9, lines 32-45; columns 9-10, lines 58-10; column 10, lines 40-57, i.e. an intersection processor feeds a voxel calculator in order to determine the volume); generating a plurality of microfacets used to approximate a shape of the geometrical shape model (column 3, lines 1-5, i.e. it is understood that microfacets are polygons and all voxels are evaluated to determine the object surface which is output as a triangle mesh model) and generating a third image by selecting texture images from the plurality of first images on the basis of the plurality of photographing directions and view direction, and projecting the selected texture images onto the microfacets (column 3, lines 42-52; column 10, lines 1-18, i.e. the background-subtracted real views and the voxel calculation (microfacets) are

provided to each unique network client on demand and a novel view/third image is generated by projecting the real views onto the microfacets according to the perspective selected by the client) but does not specifically teach optically obtaining second images that pertain to distance information of the object to be rendered; executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction and generating a third image by selecting texture images from the plurality of first images on the basis of the plurality of photographing directions and view direction, and projecting the selected texture images onto the microfacets.

Kawasaki et al. teaches optically obtaining second images that pertain to distance information of the object to be rendered (page 940, Fig. 1 and section 2.1. Image capturing process, i.e. the CCD camera obtains texture images and the range sensor obtains depth/range images that pertain to distance information of the object to be rendered); generating a geometrical shape model of the object to be rendered on the basis of the second images (page 940, Fig. 1 and section 2.1. Image capturing process, i.e. the CCD camera obtains texture images and the range sensor obtains depth/range images that pertain to distance information of the object to be rendered and generates the 3D shape); generating a plurality of microfacets used to approximate a shape of the geometrical shape model (page 940, Fig. 3; section 2.1. Image capturing process; section 2.2. Data structure, i.e. the 3D shape model is a polygonal model indicating that a plurality of microfacets have been generated to approximate the 3D shape of the object being photographed).

Sillion et al. teaches generating a geometrical shape model of the object to be rendered on the basis of the second images; generating a plurality of microfacets three-dimensionally in such a way to approximate a three-dimensional shape of the geometrical shape model (pages 6 and 8, section 4.2. Imposter creation, i.e. the geometrical shape model is created by extracting interesting contours from the texture image using the depth image and the geometrical shape model is then triangulated to generate the microfacets) and generating a third image by selecting texture images from the plurality of first images on the basis of the plurality of photographing directions and view direction, and projecting the selected texture images onto the microfacets (page 8, section 4.2. Imposter creation, Triangulation and 3D reprojection, i.e. the microfacets are reprojected in 3D using the depth image and then the texture image is applied to the 3D triangles/microfacets to generate a third imposter image that is understood to be a type of billboard image).

Dobashi et al. teaches wherein the second image pertains to distance information of the object to be rendered (page 23: Fig. 6; section 5.2.1 Rendering Clouds, 2<sup>nd</sup> paragraph, i.e. the texture corresponding to the nearest density of each metaball is mapped onto the corresponding billboard and the billboards are sorted based on their distances from the viewpoint indicating that the geometric information pertains to distance), generating a plurality of microfacets three-dimensionally in such a way to approximate a shape of the geometrical shape model (page 23: Figs. 5 and 6; column 1, section 5.2.1 Rendering Clouds, 1<sup>st</sup>-3<sup>rd</sup> paragraphs, i.e. the texture images corresponding to the nearest density of each metaball is mapped onto the

Art Unit: 2628

corresponding billboard and an image is calculated using a plurality of texture-mapped billboards indicating that a plurality of texture-mapped billboards have been generated) and executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction (page 23: Figs. 5 and 6; column 1, section 5.2.1 Rendering Clouds, 1<sup>st</sup>-3<sup>rd</sup> paragraphs, i.e. the plurality of texture-mapped billboards are oriented to the viewpoint and sorted based on their distances from the viewpoint, it is understood that orienting the billboards to the viewpoint requires rotating the plurality of billboards to make a predetermined angle with a view direction).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Suzuki et al. to include the teachings of Kawasaki et al. Sillion et al. and Dobashi et al. thereby providing an optical arrangement equipped with a range sensor to easily measure the precise 3d shape/silhouette of photographed objects such that silhouettes images may be obtained without performing the background subtraction algorithm thus reducing the processing time required (Kawasaki et al. page 940, section 2.1 Image capturing process) that provides optimal imposters/billboards that correctly produce parallax effects while reducing the number of polygons such that the 3D complexity is minimized to avoid excessive costs (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs) and a simple, easy-to-use, and computationally inexpensive method for creating realistic images using one of the standard graphics APIs, OpenGL thus making it possible to utilize graphics hardware, resulting in fast image generation since billboarding reduces the number of polygons required to generate complex scenes by

Art Unit: 2628

replacing intricate geometry with simpler texture mapped geometry (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs; Dobashi, et al.; page 19: column 1, Abstract; column 2, section 1. Introduction, lines 5-9, 15-18, 29-32 and 37-50).

Referring to claim 9, the rationale for claim 8 is incorporated herein, Kawasaki et al., as modified above, teaches a method according to claim 8, wherein the geometrical shape model is a voxel model formed of a plurality of voxels (Kawasaki et al.: page 940, section 2.1. Image capturing process and section 2.2 Data structure, i.e. acquiring the precise 3D shape model of an object by using the depth image indicates that the pixels have depth and are thus voxels; Sillion: page 8, section 4.2. Imposter creation, Triangulation and 3D reprojection, i.e. the microfacets are reprojected in 3D using the depth image indicating that the pixels have depth and are voxels), and the microfacets are generated for respective voxels (page 8, section 4.2. Imposter creation, Triangulation and 3D reprojection, i.e. the microfacets are reprojected in 3D using the depth image to generate 3D triangles indicating that the microfacets are generated for the respective voxels). The motivation statement of claim 8 is incorporated herein.

Referring to claim 12, the rationale for claim 8 is incorporated herein, Kawasaki et al., as modified above, teaches a method according to claim 8, but does not specifically teach selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and generating an interpolated image on the basis of the at least two first images, and wherein in texture mapping, the texture images are selected for respective microfacets from the plurality of



Art Unit: 2628

first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and the selected texture images are projected onto the microfacets (column 2, lines 30-37; column 3, lines 23-29 and 42-52; column 6, lines 35-46; column 7, lines 50-65; column 10, lines 45-65, i.e. novel views are interpolated from two or more real views and either a real view or an interpolated novel view is mapped/projected onto the microfacets according to the perspective chosen by the client).

Referring to claim 1, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified above, teaches an image processing apparatus comprising an optical arrangement configured to optically obtain both a plurality of first images of an object to be rendered from a plurality of different photographing directions and second images that pertain to geometry information of the object to be rendered (Suzuki et al.: Figs. 1-4; column 7, lines 25-30 and 50-65; column 9, lines 28-33 and 58-64; column 10, lines 35-40, i.e. a system comprised of multiple cameras that capture a plurality of real views; Kawasaki et al.: page 940, Fig. 1 and section 2.1. Image capturing process, i.e. the data acquisition system comprising a CCD camera and a range sensor is an optical arrangement); a memory, which stores the plurality of, first images and second images (Suzuki et al.: Figs. 1(elements 118-120 and 126), 2(elements 208-210 and 220), 3(elements 308-310 and 320), and 4(elements 408-410 and 420); column 7, lines 26-37; Kawasaki et al.: page 940, Fig. 3; section 2.1. Image capturing process; section 2.2. Data structure, i.e. a 4D texture database indicates a memory; Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 1<sup>st</sup> paragraph; page 8, section 4.2.

Art Unit: 2628

Imposter creation, column 1, step 2, i.e. storing three-dimensional information with the image from the outset, storing the depth image in a z-buffer and storing the list of 3D triangles along with the texture image, see steps 2 and 6, indicates a memory storing the plurality of 1<sup>st</sup> and 2<sup>nd</sup> images), a microfacet generation unit, a billboard processing unit and a texture mapping unit configured to perform the method of claim 8 (Kawasaki et al.: page 940, Fig. 1 and section 2.1. Image capturing process, i.e. the data acquisition system comprising a CCD camera and a range sensor is an optical arrangement; Sillion et al.: page 10, section 5.1. Performance, i.e. computing timings for real-time visualization of urban scenery through efficient imposter manipulation on an SGI Indigo2 200 MHz R4400 computer indicates an image processing apparatus having a CPU and a program comprising the structure as claimed above; Dobashi et al.: page 23: Figs. 5 and 6; section 5.2 Hardware-accelerated Rendering Using OpenGL; section 5.2.1 Rendering Clouds, 1<sup>st</sup>-3<sup>rd</sup> paragraphs, i.e. it is understood that utilizing graphics hardware to perform billboard processing requires that the graphics hardware include a billboard processing unit).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Suzuki et al. to include the teachings of Kawasaki et al. Sillion et al. and Dobashi et al. thereby providing an optical arrangement equipped with a range sensor to easily measure the precise 3d shape/silhouette of photographed objects such that silhouettes images may be obtained without performing the background subtraction algorithm thus reducing the processing time required (Kawasaki et al. page 940, section 2.1 Image capturing process) that

provides optimal imposters/billboards that correctly produce parallax effects while reducing the number of polygons such that the 3D complexity is minimized to avoid excessive costs (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs) and a simple, easy-to-use, and computationally inexpensive method for creating realistic images using one of the standard graphics APIs, OpenGL thus making it possible to utilize graphics hardware, resulting in fast image generation since billboarding reduces the number of polygons required to generate complex scenes by replacing intricate geometry with simpler texture mapped geometry (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs; Dobashi, et al.: page 19: column 1, Abstract; column 2, section 1. Introduction, lines 5-9, 15-18, 29-32 and 37-50).

Referring to claim 2, claim 2 recites the elements in claims 1 and 9 and therefore the rationale for the rejection of claims 1 and 9 are incorporated herein.

Referring to claim 5, the rationale for claims 1 and 12 are incorporated herein, Suzuki et al., as modified above, recites the elements in claims 1 and 12 and further teaches an interpolated image generation unit (column 2, lines 30-37; column 3, lines 23-29 and 42-52; column 6, lines 35-46; column 7, lines 50-65; column 10, lines 45-65, i.e. either the real views or interpolated novel views are mapped to the microfacets according to the perspective chosen by the client). It is inherent that an image processing apparatus capable of performing the method of claim 12 is comprised of an interpolated image generation unit for executing the method as described in claim 12.

Referring to claim 14, the rationale for claims 1 and 8 are incorporated herein, Kawasaki et al., as modified above, teaches a computer program product configured to store program instructions for performing the method of claim 8 (Kawasaki et al.: page 940, Fig. 1 and section 2.1. Image capturing process, i.e. the data acquisition system comprising a CCD camera and a range sensor is an optical arrangement; Sillion et al.: page 10, section 5.1. Performance, i.e. computing timings for real-time visualization of urban scenery through efficient imposter manipulation on an SGI Indigo2 200 MHz R4400 computer indicates an image processing apparatus having a CPU and a program comprising the structure as claimed above; Dobashi, et al.: page 19: Abstract, i.e. using one of the standard graphics APIs, OpenGL, indicates that computer program instructions are stored). It is inherent that graphics hardware capable of performing the method of claim 8 includes a computer system and a computer program product configured to store program instructions for executing the method as described in claim 8. The motivation statement of claim 8 is incorporated herein.

Referring to claim 15, claim 15 recites the elements in claims 14 and 9 and therefore the rationale for the rejection of claims 14 and 9 are incorporated herein.

Referring to claim 18, claim 18 recites the elements in claims 14 and 12 and therefore the rationale for the rejection of claims 14 and 12 are incorporated herein.

Claims 13, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. in view of Kawasaki et al., Sillion et al. and Dobashi et al. as applied to claims 12, 14, and 18 above, and further in view of Neugebauer, P.J., "Geometrical cloning of 3D objects via simultaneous registration of multiple range images", Shape Modeling and Applications, 1997. Proceedings, 1997 International Conference on 3-6 March 1997 Page(s)130 - 139.

Referring to claim 13, the rationale for claim 12 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 12 further comprising appending geometry information each pixel of the plurality of first images and the interpolated image on the basis of the second images (column 9, lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel calculation entails appending geometry information, depth information from the second images, to each pixel) but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

Neugebauer teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel (page 135, section 7 Visibility criterion, 1<sup>st</sup> and 2<sup>nd</sup> paragraphs; page 137, section 8.3. Direct rendering, Fig. 9).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Suzuki et al. to include the

Art Unit: 2628

teachings of Kawasaki et al. Sillion et al. and Dobashi et al. thereby providing an optical arrangement equipped with a range sensor to easily measure the precise 3d shape/silhouette of photographed objects such that silhouettes images may be obtained without performing the background subtraction algorithm thus reducing the processing time required (Kawasaki et al. page 940, section 2.1 Image capturing process) that provides optimal imposters/billboards that correctly produce parallax effects while reducing the number of polygons such that the 3D complexity is minimized to avoid excessive costs (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs) and a simple, easy-to-use, and computationally inexpensive method for creating realistic images using one of the standard graphics APIs, OpenGL thus making it possible to utilize graphics hardware, resulting in fast image generation since billboarding reduces the number of polygons required to generate complex scenes by replacing intricate geometry with simpler texture mapped geometry (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs; Dobashi, et al.; page 19: column 1, Abstract; column 2, section 1. Introduction, lines 5-9, 15-18, 29-32 and 37-50) and further eliminating self-occlusion errors and making it possible to reconstruct concave and convex objects, and even objects with holes out of an arbitrary number of range images (Neugebauer: page 130, Introduction, 3<sup>rd</sup> paragraph).

Referring to claim 19, claim 19 recites the elements in claims 13, 14, and 18 and therefore the rationale for the rejection of claims 13, 14 and 18 are incorporated herein.

Claims 3, 10, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. in view of Kawasaki et al., Sillion et al. and Dobashi et al. as applied to claims 2, 9, and 15 above, and further in view of Ogata et al. U.S. Patent No. 6313841.

Referring to claim 10, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 9, but does not specifically teach wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images.

Ogata et al. teaches wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images (Fig. 16; column 3, lines 10-28; column 10, lines 16-49, i.e. the dataset size is understood to be the number of voxels and is controlled by the level of detail, which is understood to be the precision of the second images).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Suzuki et al. to include the teachings of Kawasaki et al. Sillion et al. and Dobashi et al. thereby providing an optical arrangement equipped with a range sensor to easily measure the precise 3d shape/silhouette of photographed objects such that silhouettes images may be obtained without performing the background subtraction algorithm thus reducing the processing time required (Kawasaki et al. page 940, section 2.1 Image capturing process) that provides optimal imposters/billboards that correctly produce parallax effects while

Art Unit: 2628

reducing the number of polygons such that the 3D complexity is minimized to avoid excessive costs (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs) and a simple, easy-to-use, and computationally inexpensive method for creating realistic images using one of the standard graphics APIs, OpenGL thus making it possible to utilize graphics hardware, resulting in fast image generation since billboarding reduces the number of polygons required to generate complex scenes by replacing intricate geometry with simpler texture mapped geometry (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs; Dobashi, et al.; page 19: column 1, Abstract; column 2, section 1. Introduction, lines 5-9, 15-18, 29-32 and 37-50) thereby reducing the expensive computing costs due to processing large numbers of voxels (Ogata et al.: column 1, lines 18-27).

Referring to claim 3, claim 3 recites the elements in claims 2 and 10 and therefore the rationale for the rejection of claims 2 and 10 are incorporated herein.

Referring to claim 16, claim 16 recites the elements in claims 10 and 15 and therefore the rationale for the rejection of claims 10 and 15 are incorporated herein.

Claims 4, 6, 7, 11, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. in view of Kawasaki et al., Sillion et al. and Dobashi et al. as applied to claims 2, 5, 9 and 15 above, and further in view of Gannett U.S. Patent No. 6118452.

Referring to claim 11, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 9, further comprising



appending geometry information to each pixel of the plurality of first images on the basis of the second images (Suzuki et al.: column 9, lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel calculation entails appending geometry information, i.e. depth information from the second images, to each pixel), but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

Gannett teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel (column 7, lines 23-45; column 8, lines 34-38; column 9, lines 34-43; column 12, lines 34-51; columns 16-17, lines 55-13, i.e. voxels are eliminated based on a depth buffer test for performing hidden-surface elimination).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Suzuki et al. to include the teachings of Kawasaki et al. Sillion et al. and Dobashi et al. thereby providing an optical arrangement equipped with a range sensor to easily measure the precise 3d shape/silhouette of photographed objects such that silhouettes images may be obtained without performing the background subtraction algorithm thus reducing the processing time required (Kawasaki et al. page 940, section 2.1 Image capturing process) that provides optimal imposters/billboards that correctly produce parallax effects while reducing the number of polygons such that the 3D complexity is minimized to avoid excessive costs (Sillion: page 4, section 3.2. Definition of three-dimensional imposters,

Art Unit: 2628

3<sup>rd</sup>-5<sup>th</sup> paragraphs) and a simple, easy-to-use, and computationally inexpensive method for creating realistic images using one of the standard graphics APIs, OpenGL thus making it possible to utilize graphics hardware, resulting in fast image generation since billboarding reduces the number of polygons required to generate complex scenes by replacing intricate geometry with simpler texture mapped geometry (Sillion: page 4, section 3.2. Definition of three-dimensional imposters, 3<sup>rd</sup>-5<sup>th</sup> paragraphs; Dobashi, et al.; page 19: column 1, Abstract; column 2, section 1. Introduction, lines 5-9, 15-18, 29-32 and 37-50) and further providing significant performance enhancements (Gannett: Abstract; columns 9-10, lines 60-13).

Referring to claim 4, the rationale for claim 11 is incorporated herein, Kawasaki et al., as modified above, recites the elements in claims 1 and 11 but does not specifically teach a clipping process unit.

Gannett teaches a clipping processing unit (Figs. 1A, 1B(element 160) and 2; column 5, lines 8-19; column 7, lines 23-45; column 8, lines 34-38; column 9, lines 34-43; column 12, lines 34-51; columns 16-17, lines 55-13, i.e. voxels are eliminated based on a depth buffer test for performing hidden-surface elimination in processing stages 160-164 of a graphics pipeline indicating a clipping processing unit comprised of processing stages 160-164). The motivation statement of claim 11 is incorporated herein.

Referring to claim 17, claim 17 recites the elements of claims 4 and 15 and therefore the rationale for the rejection of claims 4 and 15 are incorporated herein.

Referring to claim 6, claim 6 recites the elements of claims 4 and 5 and therefore the rationale for the rejection of claims 4 and 5 are incorporated herein.

Referring to claim 7, claim 7 recites the elements of claim 4 and therefore the rationale for the rejection of claim 4 is incorporated herein.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-19 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues, with respect to the objection to the drawings, "...In the Office Action Figures 5A-C, 8A-D, 9A-E and 10A-D of the drawings were again objected to. In response to the objection asserting that Figures 5A-C, 8A-D, 9A-E and 10A-D are "unintelligible, it is noted that the response filed on October 27, 2005, included black and white photographs as new Figures 5A-C, 8A-D, 9A-E and 10A-D. If the present objection is being made as to these newly submitted black and white photographs as the new Figures 5A-C, 8A-D, 9A-E and 10A-D, an explanation as to what, specifically, is being objected to as being unintelligible in these black and white photographs is respectfully requested. In this regard and as noted in the response filed October 27, 2005, it is respectfully submitted that photographs are the only practical medium to intelligibly show features of the present invention, including the microfacets..."

Examiner respectfully submits that the petition to enter the black and white photographs submitted as new Figures 5A-C, 8A-D, 9A-E and 10A-D has been approved and therefore the objection to the drawings has been withdrawn.

Art Unit: 2628

Applicant then argues, with regards to the rejection of claims 1, 2, 5, 8, 9, 12, 14, 15, and 18, that neither Suzuki et al. nor Dobashi et al. teach or suggest optically obtaining "first images of an object to be rendered from a plurality of different photographing directions and second images that pertain to geometry information of the object to be rendered."

Examiner respectfully submits that Suzuki et al. teaches generating a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions and a second image that pertains to geometry information of the object to be rendered as was claimed prior to the amendment filed 3/26/2007, see Figs. 1-4; column 7, lines 50-65; columns 7-8, lines 66-6 wherein the first images are optically captured and then second silhouette images are generated from the first images. The limitation of optically obtaining both the first and the second images from an apparatus having an optical arrangement configured to do so was added in the amendment filed 3/26/2007 and has been addressed in the rejection of claims 1 and 8 above.

Applicant then argues that Suzuki et al. does not teach generating a plurality of microfacets three-dimensionally in such a way to user-to approximate a three-dimensional shape of the geometrical shape model and generating a third image by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by projecting the selected texture images onto the microfacets, see Remarks pages 11-12, lines 8-5.

Examiner respectfully submits that Suzuki et al. teaches wherein silhouette images are obtained via the silhouette processor disclosed in the NPL titled Appearance-Based Virtual View Generation of Temporally-Varying Events From Multi-Camera Images In The Three-Dimensional Room and that intersections of rays projected through the silhouettes is performed by the intersection processor to output voxels and voxel calculation is performed by a voxel processor to calculate the voxels representing the object such that a volumetric model is obtained and that the voxel calculation and selected real views are supplied to clients to be rendered (column 3, lines 1-5; columns 7-8, lines 65-8; column 8, lines 20-33 and 50-65) thus indicating the generation of a plurality of microfacets to approximate a three-dimensional shape of the geometrical shape model and the generation of a third image as claimed, a copy of the NPL has been provided.

Applicant then argues that the images of Dobashi are animations and not real images as in Suzuki and thus the Dobashi cloud simulations are completely different as to the viewing of solid objects taught by Suzuki to include viewing these real solid objects from different directions.

Examiner respectfully submits that Dobashi is relied on to teach generating a plurality of microfacets three-dimensionally in such a way to approximate a shape of the geometrical shape model, i.e. such as the shape of a cloud, and executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction, see Dobashi: page 23: Fig. 6; section 5.2.1 Rendering Clouds, 2<sup>nd</sup> paragraph; page 23: Figs. 5 and 6; column 1, section 5.2.1 Rendering

Art Unit: 2628

Clouds, 1<sup>st</sup>-3<sup>rd</sup> paragraphs; page 23: Figs. 5 and 6; column 1, section 5.2.1 Rendering

Clouds, 1<sup>st</sup>-3<sup>rd</sup> paragraphs, i.e. the plurality of texture-mapped billboards are oriented/rotated to the viewpoint and sorted based on their distances from the viewpoint, Suzuki is depended on for the teaching that the texture images are real images. Dobashi is relied upon for the teaching of the billboarding process, which is well known by those having ordinary skill in the art at the time the invention was made to include cylindrical, spherical, and imposter type billboards.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Art Unit: 2628

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RP 6/15/2007

  
Ulka Chauhan  
Supervisory Patent Examiner